

# A Study on Environmental Equity in Albuquerque, New Mexico: Executive Summary

Amy Baker (1), Gloria Cruz (supplemental atlas) (2)\*

(1) Doctoral Candidate, Economics Department, University of New Mexico, Albuquerque, NM; co-project lead, report author; (2) Data Analyst III, Albuquerque Environmental Health Department, Albuquerque, NM; co-project lead, GIS support and map production

Note: This paper contains the executive summary of the report, *A Study on Environmental Equity in Albuquerque, New Mexico*. For a copy of the full report, contact Gloria Cruz.

## Abstract

A study on environmental equity in Albuquerque, New Mexico, analyzed the distribution of sites of environmental concern relative to host community demographic composition. In two phases, the study analyzed environmental equity issues involving the 419 census-defined block groups within the Albuquerque metropolitan area using a geographic information system (GIS) and rigorous statistical modeling. The GIS proved to be a very powerful tool for determining the accuracy of the models and linking the statistical data with spatial analysis. Geographic analysis was used to determine the relationship between environmental sites, demographic data, voter participation, and major transportation corridors. Voter participation and proximity to major transportation corridors were found to be strong indicators of site presence and number. In Phase II, the GIS was used to aggregate block group-level data to the neighborhood level and to calculate the mean populations of the various social groups for the study area. Additional social groupings were included—e.g., children and elderly people in poverty. Areas of special concern were identified based on whether or not they fell above the mean (depending on the criteria); that is, based on how their demographic characteristics related to those of other Albuquerque neighborhoods. Mean difference tests established whether these areas of special concern contained disproportionate numbers of sites. This study involved the creation of a supplemental atlas, which contains over 60 maps including location and bivariate maps of environmental sites overlaid on polygons representing various types of demographic composition. The Albuquerque Geographic Information System, the GIS used in this study, has been online since 1986. The GIS software used by the City of Albuquerque is ARC/INFO (ESRI, Redlands, CA). The hardware components of the system are a Sun S690 server, a Sun Classic workstation, a Hewlett Packard Color LaserJet printer, and a Hewlett Packard DesignJet printer.

Keywords: private, environmental equity, Census

The Albuquerque (New Mexico) City Council allocated funds in its fiscal year 1997 operating budget to the Albuquerque Environmental Health Department (AEHD) for a study identifying the relationships of demographic factors with sites of environmental

\*Gloria Cruz, Albuquerque Environmental Health Department, PO Box 1293, Albuquerque, NM 87103 USA; (p) 505-768-2603; (f) 505-768-2617; E-mail: gcruz@cabq.gov

concern (“environmental sites” or “sites”),<sup>1</sup> using appropriate statistical and econometric techniques. AEHD hired an intern, a doctoral candidate aided in an advisory capacity by professors in the University of New Mexico (UNM) Economics Department, to conduct the study as co-project lead in conjunction with the AEHD Environmental Services Division. The study took place between July 1996 and June 1998. This status report describes two phases of the study, its results, and those recommendations for further action that have been attained thus far.

Phase I of the study analyzed environmental equity issues involving the 419 census-defined block groups within the Albuquerque metropolitan area using a geographic information system (GIS) and econometric and statistical techniques (probit and tobit models and mean difference tests). These tools were used to discern whether systematic distributional relationships existed between the 1,387 environmental sites and the differing racial, ethnic, socioeconomic, and collective-choice characteristics of their (block group-level) host communities. “Collective choice” refers to the propensity of residents in an area to engage in collective action, or to the level of political activity within a community. For the purposes of this study, the sites were identified by the federal environmental regulatory statute applied to each site type. Although contamination events were included, actual or potential contamination was not a prerequisite for inclusion in the study.

Racial, ethnic, and socioeconomic information from the 1990 US Census and voter participation results from the Bernalillo County Clerk were used as the demographic information describing each community. Financial data on the disbursement of public funds for remediation of leaking underground storage tanks (LUSTs) were obtained from the New Mexico Underground Storage Tank Bureau (the Bureau) and incorporated into the analysis. AEHD used GIS software called ARC/INFO (ESRI, Redlands, CA) to evaluate the locations, types, and number of environmental sites relative to the block groups. The intern used the statistical package SHAZAM (University of British Columbia, Vancouver, BC, Canada) to model the statistical relationships between site location, public funds distribution, and community social factors. The study relied on available cross-sectional data, which essentially provided a snapshot view of the situation as it *currently exists*. Caution, therefore, is urged in any attempt to infer cause and effect relationships from study results. The full report contains definitions for the environmental sites and other terms.

The sites were divided and grouped by type for analytical purposes. LUST sites were examined separately to facilitate comparison between the distribution of the actual sites and the distribution of Bureau funds among these sites. The remaining sites were grouped into four categories depending on the type of regulation applied to them. The models used in this study then attempted to explain the systematic pattern of distribution of the four categories relative to community demographic composition. In addition, areas of special concern (ASCs) were identified and descriptive statistical

<sup>1</sup> In this study, sites of environmental concern were identified and defined by the type of regulatory statute applied to them. Environmental sites, therefore, included contamination events (regulated by the Comprehensive Environmental Response, Compensation, and Liability Act), hazardous waste generators (Resource Conservation and Recovery Act), and hazardous product facilities (Superfund Amendments and Reauthorization Act, Title III). Leaking underground storage tanks were also classified as environmental sites.

techniques (mean difference tests) were used to compare the distribution of sites within ASCs to distribution of sites in the rest of Albuquerque.<sup>2</sup>

Phase II of the study extended the ASC analysis and used more of the available data to focus on a more diverse set of social factors. The econometric models (probit and tobit) used in Phase I could only analyze a limited amount of information at one time due to modeling problems (specifically, multicollinearity). Study participants were interested in analyzing equity issues involving a more diverse set of social groups. In addition, most participants found block groups to be of little use as units of analysis. Therefore, it was determined that a neighborhood-level analysis would be more amenable to the discussion of policy implications. The data were aggregated to this level, neighborhood ASCs were identified, and statistical analyses were used to determine whether a statistical difference existed between the average number of sites within the ASCs and the average number outside the ASCs.

The study results indicate that on a citywide basis, sites included in the four groups may be distributed disproportionately by levels of community political activity, but not by communities' ethnic or socioeconomic composition. The empirical models incorporated in this study showed no evidence to support a systematic pattern of environmental discrimination against persons of Hispanic origin, low-income communities, or communities with relatively high percentages of persons achieving low educational attainment levels. However, the models did reveal strong patterns in the context of collective choice. The models showed that as the percentage of eligible voters in a block group who actually voted in the 1996 presidential election increases, the probability that an environmental site will be located in that block group and the number of sites in that block group decrease. This result proved to be somewhat robust, appearing throughout most of the estimated models. For the most restricted site grouping (Group 4, which included only the contamination events and Resource Conservation Recovery Act sites that produced high quantities of hazardous waste or were permitted to treat, store, or dispose of hazardous waste), however, only three of the models estimated using this dependent variable yielded evidence of this effect, and that evidence was marginal.

In a more targeted analysis, there was evidence of inequitable site distribution emerging in the context of racial, ethnic, and socioeconomic composition. However, these burdens occurred on both sides of the demographic strata, depending on the type of site being discussed. For instance, primarily non-Hispanic neighborhoods contain on average more hazardous waste facilities within their associated block groups—the opposite of the expected result. These results need to be investigated further to establish their impact, if any, on policy and community action.

The LUST site analysis results imply that these sites *are* distributed inequitably among social groups based on ethnic composition and level of political activity, but that the public funds used to remediate these sites *are not* distributed inequitably in most cases.

Finally, Phase II identified 13 ASCs based on many different social factors. These included the five that were used in Phase I (race/ethnicity, socioeconomic factors,

<sup>2</sup> This targeted analysis was motivated by suggestions from the Albuquerque City Council's original legislation.

educational levels, proximity to the highway, and voter participation), though Phase II defined them differently. In addition, Phase II incorporated elderly people and children living below poverty, unemployment rates, and non-English-speaking communities, among others. The results of the Phase II mean difference tests provide limited evidence that the environmental sites in the study disproportionately burden all but 3 of the 13 identified social groups. The populations living in poverty (particularly, within that category, children and single-female-headed households) are the primary groups impacted by site location. In addition, more sites are found, on average, in neighborhoods with relatively high unemployment rates and relatively politically inactive populations. Finally, the results provide little or no evidence that high migratory rates, high rates of single-male-headed households living in poverty, or high rates of elderly people living in poverty indicate site location or inequitable impact by environmental sites.

Many factors may contribute to the disparities above. One of the main factors is proximity to major transportation corridors, although this effect was considered in most analyses. Other factors that may contribute to the disparate results include the history of residential and industrial growth in the same areas, zoning ordinances, environmental regulations, and property values. However, the study did not try to determine reasons or causes for facility distribution relative to demographics, nor did it try to discern the effects of these factors. Causal relationships were not addressed in this study. The study did not attempt to formally measure potential risks in relation to the environmental sites or the communities in which they exist.<sup>3</sup> These are important issues and naturally follow the subject of the study, but they were beyond the study's scope and budget.

In addition to the report, the study also produced a supplemental atlas, which contains maps that clarify the environmental equity situation as it currently exists in Albuquerque. The maps show locations of the environmental sites, block group demographics, and the ASCs at both the block group and neighborhood levels.

The database used to create this report and the supplemental atlas is readily available for future studies. It is a database of the 1990 US Census data by block group, the 1996 Albuquerque voter results (by precinct, but disaggregated to the block group level), the locations of the environmental facilities addressed in this report, and a detailed summary of public funds disbursed to LUST sites. Its format is GIS-based and its flexibility of form makes it easy to expand on, given available data sources. Reasons for expansion may include extending the project into additional phases and the need to reflect Albuquerque's ever-changing environmental and demographic characteristics.

Data enhancements would facilitate the work to be conducted in subsequent phases of the project. Also helpful would be general coordination within and between city and state agencies, the Albuquerque City Council, local environmental/citizen groups, and the US Environmental Protection Agency. Coordination between agencies has already begun in the form of increased communication between the AEHD and the Bureau. Followup suggestions include expansion of the database to include air quality data and risk measurements. This would allow a risk-based equity study, as opposed to the proximity-based analysis used in this report. Also, public health data could be

<sup>3</sup> A risk ranking, assigned to LUST sites by the Bureau, was incorporated in the analysis of fund distribution among these sites.

incorporated to determine which areas need additional public health intervention and program resources. Further data enhancements would involve updating the 1990 Census data to the 2000 Census data, which would make it possible to compare the two sets of data. This comparison could lead to a “process” equity study (as opposed to this “outcome” equity study), which could begin to explore causal relationships between site location and host community demographic composition.

Taking into account the limitations of the study, the results and their implications should be viewed with caution. Based on the results thus far, promotion of political activity, in the form of increased voting percentage within a community, should be a main concern. The level of political activity within a community is the strongest social indicator of presence and number of environmental sites. Proximity to major transportation corridors is another indicator of site distribution. These two results could have policy implications in the acquisition of Brownfields and Empowerment Zone/Enterprise Community funds. Albuquerque policy makers concerned with environmental justice issues can target areas of relatively low levels of political power and those near major thoroughways in an effort to obtain funds that can be used in the revitalization.

Given that many of the social groups (e.g., the unemployed, children in poverty) analyzed in Phase II were disproportionately burdened by hazardous materials sites (as defined by the Superfund Amendments and Reauthorization Act), the study participants recommend several policy actions to the City and AEHD. Policy makers should be aware of the locations of ASCs and ensure that new industrial facilities are not located in these areas. In addition, to help alleviate the strain of poverty and unemployment on ASCs, businesses could be given incentives to hire from the communities surrounding them. Finally, all city departments should re-evaluate their programs to ensure that these communities are receiving the services they require.